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### CONSERVING SUGAR IN ICE CREAM MANUFACTURE

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Since the Food Administration has limited the ice cream manufacturers to 80 percent of their 1917 sugar supply, the question that is uppermost in the mind of every ice cream manufacturer is, How am I to meet the sugar situation and maintain my business?

Altho the sugar contributes to the food value of the ice cream, its prime function is to properly sweeten the product to make it palatable. The food value can be replaced by other food products less precious than sugar.

There are several substances that have been used in ice cream in order to conserve sugar. Some of these substances are glucose, corn sugar, and commercial invert sugar. The glucose and corn sugar are considered sugar substitutes by the Food Administration but the invert sugar is not so considered because it is manufactured from the same sources as sugar. Sugar, however, can be saved by the use of invert sugar because inversion increases the total sweetness.

Sugar when taken into the body is acted upon by the invertase in the intestines and changed from sucrose to dextrose and levulose in equal proportions. Dextrose is not so sweet as sugar, but levulose is sweeter. In addition, levulose possesses a pronounced flavor which is quite characteristic of honey and which makes it taste sweeter than sugar. Accordingly, if sugar is inverted before being used in ice cream, its sweetening power is increased.

Cane sugar (or beet sugar) can be inverted by the simple process of heating in the presence of an acid. The chemical reaction that takes place results in the same products being formed as are formed when the sugar (sucrose) is taken into the human body, the sugar

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forming equal parts of dextrose and levulose. The following formula may be used in making invert sugar sirup of such sweetness that a pound of the sirup will replace a pound of sugar.

100 pounds of sugar  
44 pounds of water  
50 grams of powdered tartaric acid

These ingredients are mixed together and boiled for 30 to 35 minutes. If boiled longer than 35 minutes, the sirup darkens in color and a flavor develops which tends to make the sirup resemble glucose sirup, and this is somewhat undesirable. This solution boils at a temperature of about 221 degrees Fahrenheit. A steam pressure kettle can be used very satisfactorily or an open candy kettle over a steady fire may be used. If the solution is boiled too vigorously, there will be too large a loss by evaporation. Ordinarily the loss will be from 3 to 5 percent.

The above formula should make 140 pounds of sirup, and if there is considerable loss due to evaporation, the sirup can be brought up to this weight by the addition of water. The resultant invert sugar sirup is not unlike strained honey in appearance and taste. It contains about 71.4 percent of sugar and it tastes considerably sweeter than a sugar sirup of the same strength. It does not crystallize, and it mixes readily with the ingredients of the ice cream. It can be used in the same proportions as sugar, the amount necessary for ten gallons of ice cream being 6.5 to 7 pounds. It gives very satisfactory results in freezing and a pleasant flavor in the finished product.

It can be readily seen that by using the above method the sugar supply can literally be stretched, for with only 71.4 percent as much sugar as is now being used in ice cream, the same degree of sweetness can be obtained.

A further saving of sugar can be accomplished by substituting either corn sugar or glucose for part of the invert sugar sirup. Neither of these substitutes can be used to totally replace the sugar or invert sugar because of the undesirable flavors which are imparted to the ice cream when used in such amounts. However, they can be used to replace from 25 to 40 percent of the sirup, depending upon the quality of these products. Neither glucose nor corn sugar is as sweet as cane sugar, so that it is not possible to use either of them to replace cane sugar pound for pound. Glucose is about 60 percent and corn sugar is about 80 percent as sweet as cane sugar.

The United States Department of Agriculture has permitted the use of these sugar substitutes providing the consumer is properly informed that such substitution has been made. Some of the state food departments have taken the same attitude, whereas others have not as yet given any decision on this question.

Conserving sugar at this time is not only meeting the demands of the ice cream business, but it is also a patriotic duty.